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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/819,370	03/28/2001	Yoshiaki Watanabe	225-010254-US(PAR)	4335

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EXAMINER
MONDT, JOHANNES P

ART UNIT	PAPER NUMBER
2826	

DATE MAILED: 04/17/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/819,370	WATANABE ET AL.
	Examiner	Art Unit
	Johannes P Mondt	2826

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 January 2003* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2 and 4-7* is/are rejected.

7)☒ Claim(s) *3* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Response to Amendment

Amendment A filed 01/29/2003 and entered as Paper No. 8. In Amendment A, Applicant amended claim 1 and, thereby all other outstanding claims, through their dependence on claim 1. Comments on Applicant's Remarks, as contained in said Amendment A, are included below under "Response to Arguments", but are confined to those aspects of the rejections that are still relevant to the new claim set.

Response to Arguments

The Remarks by Applicant as made in Amendment A have been fully considered, but are not found to be persuasive. In particular, with regard to the remarks on the 102(b) rejection (pages 3-5 in Amendment A), Applicant states that the absorption as implied by the Kramers-Kronig relations is negligible, but fails to provide, in the claim language, a measure for what constitutes negligible, either in absolute terms or as a fraction of the absorption in the device of the invention. The remainder of the Remarks by Applicant on the 102(b) rejection is moot in view of the substantial amendment of claim 1. With regard to the rejections under 103(a), they depend on the new claim language (absorbing layer includes metal). In view of said substantial amendment of the claims 1-7 a new rejection for said claims is herewith issued. The present action would have been final if it would not for the discovery of art against claim 2, for which a first rejection is herewith included.

Claim Rej ctions - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. ***Claims 1 and 4-7*** are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al (5,982,804) in view of Yamanaka (JP405021889A). Chen et al teach Chen et al teach (cf. Figures 3 and 14) a semiconductor laser comprising:

an active layer 11 made of semiconductor (*claim 1*), particularly one active bulk or single (quantum well) or multiple quantum well layer of $In_{1-x}Ga_xAs_{1-y}P_y$ (*claim 5*) (cf. column 4, lines 42-43);

a ridge stripe 15 (cf. column 4, line 51) having a cladding layer 12 (cf. column 4, line 53) formed on said active layer 11 (*claim 1*), said cladding layer being made of InP (cf. column 4, line 44) (*claim 5*) and a contact layer 13 (cf. column 4, lines 45-46) formed on the cladding layer to protrude from said active layer (*claim 1*), said contact layer being made of InGaAsP (cf. column 4, lines 45-46) (*claim 6*);

a pair of gratings 120 (cf. column 8, line 23) each having a periodic structure in a longitudinal direction of the ridge stripe having a plurality of grooves each extending from side walls of the ridge stripe on flat portions in both sides of the ridge stripe (see Figure 14) (*claim 1*); said pair of bracket gratings further comprise bracket grating portions each having a slope surface extending from a flat top portion of the ridge stripe

to a top face of a land portion defined by the adjacent grooves and coupling the side walls of the ridge stripe and gratings (cf. column 6, lines 54-62 and Figure 14) (*claim 4*);

said pair of gratings being periodic variations of the index of refraction (cf. column 5, lines 14-15) and hence, according to the Kramers-Kronig relations, periodic variations of absorption, hence having absorbing layers covering the surfaces of the grooves of gratings to absorb excited light (*claim 1*); while Chen et al also teach the semiconductor laser to have an active layer, either bulk, single (quantum well) or multiple quantum well layer (see claim 2 by Chen et al) composed of $In_{1-x}Ga_xAs_{1-y}P_y$ (cf. column 10, lines 27-32) while the cladding layer is made of InP (cf. column 10, lines 27-32).

With regard to *claim 7*: the further limitation of this claim is met as a direct consequence of the final structure, because wave guide layer 111 (without grating) is located beneath and gratings 120 are coupled laterally thereto by dint of their location and orientation (cf. column 8, line 27 and Figure 14).

Chen et al do not necessarily disclose the abovementioned absorbing layers to include metal to cover the groove surfaces. However, in a patent on a semiconductor laser device, - hence pertinent to the field of application of the gratings taught by Chen et al, and for the specific purpose of controlling the polarization of the laser light, Yamanaka teaches the surfaces of the grooves of the grating (5) to be covered with metal, particularly gold (Au) (6) (cf. English abstract, "Constitution", first sentence; and Figure 1).

Motivation to include the teaching by Yamanaka in this regard into the invention by Chen et al stems from the advantage to control the polarization of the laser output.

Combination of said teaching with said invention is readily possible as the grating 120 can be covered with a gold layer. *Success* of the implementation of said combination can therefore be reasonably expected.

2. ***Claim 1*** is rejected under 35 U.S.C. 103(a) as being unpatentable over Fiddyment et al. (4,805,184) in view of Chen et al (Electronics Letters 32 (14), pp. 1288-1290) and Yamanaka (JP405021889A).

Fiddyment et al teach a semiconductor laser (cf. abstract, lines 8-9) comprising:

an active layer 4 made of a semiconductor (cf. column 5, lines 38-43);

a ridge stripe 7 (cf. column 5, lines 57-67) having a cladding layer 5 (cf. column 5, lines 35-45) formed on said active layer and a contact layer 15 (cf. column 6, lines 44-45) formed on the cladding layer to protrude from said active layer;

a pair of gratings 6 (cf. column 5, lines 45-57) each having a periodic structure in a longitudinal direction of the ridge stripe having a plurality of grooves each extending from side walls of the ridge stripe flat portions in both sides of the ridge stripe (cf. column 5, lines 51-53).

Fiddyment et al do not necessarily teach absorbing layers including metal formed on the gratings to cover the surfaces of the grooves of the gratings, to absorb excited light.

However, it has long been understood that periodic gratings in distributed feedback laser devices can be exploited to implement the gain-coupling mechanism for

the specific purpose providing absorptive grating with periodic variation of the absorption coefficient, as shown by for instance Chen et al (cf. abstract), and the lasers in which this mechanism to achieve improved effective coupling coefficient (cf. page 1288). Although Chen et al do not necessarily teach said absorbing layers to include metal, in a patent on a semiconductor laser device, - hence pertinent to the field of application of the gratings taught by Chen et al, and for the specific purpose of controlling the polarization of the laser light, Yamanaka teaches the surfaces of the grooves of the grating (5) to be covered with metal, particularly gold (Au) (6) (cf. English abstract, "Constitution", first sentence; and Figure 1).

Motivation to include the teaching by Chen et al and Yamanaka in this regard into the invention by Fiddyment et al is thus found in

(a) the expected rise in the effective coupling coefficient and consequently in the net gain. The inventions can be easily *combined* to cover the surfaces of the grooves of the gratings with material that absorbs light of the wavelength excited by the laser. *Success* in implementing the combination can therefore be *reasonably expected;* and

(b) the advantage to control the polarization of the laser output. *Combination* of said teaching with said invention is readily possible as the gratings in Fiddyment et al can be covered with a gold layer. *Success* of the implementation of said combination can therefore be *reasonably expected.*

3. ***Claim 4*** is rejected under 35 U.S.C. 103(a) as being unpatentable over Fiddyment et al, Chen et al and Yamanaka as applied to claim 1 above, and further in view of Stegmüller (4,761,791). As detailed above, claim 1 is unpatentable over Fiddyment et al in view of Chen et al and Yamanaka, neither of whom, however, necessarily teach the further limitation of claim 4. However, as shown by Stegmüller, it has long been known in the art of gratings for ridge semiconductor laser devices (cf. title, abstract, and column 1, lines 6-20) that the grating structure can be made in an uninterrupted manner to include what Applicant calls bracket grating portions, i.e., portions that extend over the ridge and possibly over the laser active region (see Figures 2). Note that the grating in Stegmüller is a periodic variation of the refractive index, and thereby, in light of the Kramers-Kronig relations, also a periodic variation of the absorption coefficient.

Motivation to do so also in the invention essentially taught by Fiddyment et al stems from the advantage of avoiding the need to interrupt the epitaxial manufacturing method of the double-hetero-layer device, as explained in Stegmüller, thereby improving the quality of the device and reducing the expense of the manufacturing process (cf. column 1, lines 37-55). The inventions can be *easily combined,* because all that is needed to implement the relevant teaching of Stegmüller in this regard is to extend the steps listed in column 4, lines 15-33, in Fiddyment et al to the include the ridge stripe area 7, while this would obviously also make it possible to perform said steps in one cycle. *Success* in implementing the teaching of Stegmüller in this regard can therefore be *reasonably expected.*

4. ***Claim 2*** is rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al and Yamanaka, or in the alternative, over Fiddyment et al, Chen et al and Yamanaka, as applied to claim 1 above, and further in view of Mochizuki et al (JP62237427A). As detailed above, claim 1 is unpatentable over either Chen et al in view of Yamanaka, or, in the alternative, over Fiddyment et al in view of Chen et al and Yamanaka, none of whom necessarily teach the further limitation of claim 2. However, in a patent on a light modulating element including a diffraction grating, - hence the art of both Chen et al and Fiddyment et al, Mochizuki et al teach that the need for one process step for forming an insulating film in the method of making a diffraction grating 8 can be eliminated by forming the relief pattern and adjacent projecting parts of the same material, thus providing a continuous pattern and thereby also improving its adhesiveness to the substrate (cf. English abstract, "Purpose"); consequently, the absorbing layer 1/2/5 comprises a first insulator 5 (such as liquid crystal) kept in contact with the surfaces of the grooves of the gratings, a metal layer 2 contiguously formed on the first insulator, and a second insulator 1 (such as glass substrate) contiguously formed on the metal layer.

Motivation to include the teaching by Mochizuki et al in the invention as essentially taught by either Chen et al or Fiddyment et al stems form the desirability to omit a process step while increasing the adhesiveness and thus the integrity of the product (cf. English Abstract, "Purpose", first sentence). *Combination* of said teaching with said inventions is readily accomplished as consecutive deposition of liquid crystal,

metal and glass layers is standard in the art, while no alteration of the product in any other aspect is required. *Success* in implementing the teaching can therefore be reasonably expected.

Allowable Subject Matter

1. ***Claim 3*** is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The following is a statement of reasons for the indication of allowable subject matter: No art has been found in which the absorbing layer in absorptive or loss grating in a semiconductor laser comprises an insulator material as matrix and metal particles dispersed therein.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Johannes P Mondt whose telephone number is 703-306-0531. The examiner can normally be reached on 8:00 - 18:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan J Flynn can be reached on 703-308-6601. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

JPM
April 10, 2003

NATHAN J. FLYNN
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